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HYDROGENATION OF OIL.

United States District Court

SOUTHERN DISTRICT OF NEW YORK.

PROCTER & GAMBLE COMPANY,

vs.

BERLIN MILLS COMPANY.

**Opinion Rendered by Judge Augustus N. Hand on Burchenal
Patent No. 1,135,351.**

October 3, 1917.

United States District Court

SOUTHERN DISTRICT OF NEW YORK.

PROCTER & GAMBLE COMPANY,
Complainant,

against

BERLIN MILLS COMPANY,
Defendant.

KERR, PAGE, COOPER & HAYWARD, Solicitors for
Complainant, Alfred N. Allen, Livingston
Gifford and Thomas B. Kerr, Counsel.

JOHN C. PENNIE, Solicitor for Defendant, Marcus
B. May and John C. Pennie, Counsel.

AUGUSTUS N. HAND, District Judge:

This suit is for infringement of patent No. 1,135,351, granted to the complainant as assignee of John J. Burchenal on April 13th, 1915. The application for the patent was filed November 10th, 1910. The specification states that the invention is for a food product consisting of a vegetable oil, preferably cottonseed oil, partially hydrogenized and hardened to a homogeneous white or yellowish semi-solid clearly simulating lard.

Claims 1 and 2 alone are in issue and read as follows:

"1. A homogeneous lard-like food product consisting of an incompletely hydrogenized vegetable oil.

"2. A homogeneous lard-like food product consisting of incompletely hydrogenized cotton-seed oil."

The special object of the invention is, according to the specification:

"* * * to provide a new food product for a shortening in cooking in which the liability to become rancid is minimized and in which the components of such vegetable oils which are inferior and detrimental to use as such a food product have been to a large extent converted into a higher and more wholesome form. All such vegetable oils contain glycerids of unsaturated fatty acids and among these notable quantities of fatty glycerids of lower saturation than olein. It is the presence of these glycerids of lower saturation that seriously affects the rancidity of the material. Oxidation is largely the cause of rancidity which oxidation weakens the fat at the point of absorption at the double bonds, and these glycerids of lesser saturation readily absorb oxygen from the air at ordinary temperatures while the more highly saturated glycerids, as olein, only absorb oxygen at elevated temperatures. It is evident, therefore, that oils or fats containing notable quantities of glycerids of linolic acid or of lesser saturation are distinctly inferior as an edible product to those containing a minimum of these glycerids with a larger per cent. of olein. On the other hand while it is important to get rid of the readily oxidizable glycerids of lower saturation, it is also important not to supply too large a per cent. of fully saturated glycerids.

"* * * In manufacturing this product cottonseed or other vegetable oil is caused to chemically absorb a limited amount of hydrogen by reacting on the oil with hydrogen in the presence of a catalytic agent and at an elevated temperature. The oil is preferably agitated in a closed vessel in the presence of an atmosphere of compressed hydrogen, a catalyser of finely-divided nickel carried by kieselguhr being maintained in suspension in the oil and its temperature being raised to about 155° C.

"According to the present invention, the amount of hydrogen absorbed is carefully regulated and limited. In practice, the operation is stopped when the oil has been converted into a product which cools to a white or yellowish semi-solid more closely resembling lard than do the commercial mixtures of cottonseed oil and animal oleo-stearin while in many respects the product is superior to the best leaf lard as a shortening. It is not so liable to become rancid and the product can be heated to a considerably higher temperature than lard without smoking or burning. The high temperature to which my product can be raised without smoking or burning makes the product ideal for frying, inasmuch as a crust forms almost instantly on the food fried, which prevents any absorption of the shortening. A lard-like product thus prepared from cottonseed oil has a saponification value of about 195 and an iodine value ranging from about 55 to about 80. The product having an iodine value of 55 has a titer of about 42° and a melting point of about 40° C, that having an iodine value of 80 has a titer of about 35° and a melt-

ing point of about 33° C. While but partially hydrogenized, containing from about 1.5% to 2.5% of additional hydrogen more than in the non-hydrogenized material, it shows no free cottonseed oil when subjected to the Halphen test, thereby differing from all commercial lard substitutes containing this oil. It contains from twenty to twenty-five per cent. of fully saturated glycerids, from five to ten per cent. linolin, and from sixty-five to seventy-five per cent. olein; and an average of a number of samples gives twenty-three per cent. of saturated fats, seven and five-tenths per cent. linolin and sixty-nine and five-tenths per cent. olein, while the cottonseed oil before treatment contained seventeen per cent. saturated fats, thirty-seven per cent. linolin and forty-six per cent. olein. It will thus be seen that I have produced an ideal food product which is high in olein, low in linolin and lesser saturated fats and with only enough stearin to make the product congeal at ordinary temperatures."

The complainant urges that Burchenal first taught the art that a partially hydrogenated vegetable oil, preferably cottonseed oil, was edible and was a useful lard substitute. It contends that prior to Burchenal's conception it was not known that hydrogenated cottonseed oil was edible and that the only processes then in use aimed at complete saturation and produced a hard non-edible product. Before discussing the prior art, I would say in general that Normann, whose patent will later be referred to, had already disclosed a method of hydrogenating oils, and had set forth in his specification that the process was progressive and involved "no secondary reaction." The method of

adding cottonseed oil to beef stearin for use as a lard compound was well known and much used, as it still is. The hydrogenation of cottonseed oil resulted in a reduction of the fluid and substitution of the solid fats. Normann's patent, as well as various experiments of scientists, indicated that the addition of hydrogen to cottonseed oil would result in the reduction or elimination of the fluid and substitution of solid or partially solid fats. No one has shown that the product resulting from such hydrogenation was ever non-edible or unsanitary in any respect.

The British patent No. 10,783 (1887), to Joseph Sears was for a lard substitute composed of refined unbleached cottonseed oil and a fat adapted to give a stiffness to the compound corresponding substantially to that of refined lard. The specification provided that the temperature should be raised sufficiently to melt the fat or stearin, the heated ingredients mixed and then chilled rapidly so as to prevent crystalization and separation. This general process was well known in the art before the date claimed for the invention of Burchenal and indeed is referred to in the patent in suit. A very large market for such lard-like compounds exists at the present time and has existed many years past.

The British patent No. 1515 of 1903, to Normann discloses a process for the reduction of glycerines resembling that of the patent to Burchenal. Normann's patent says that:

"The property of finely divided platinum to exercise a catalytic action with hydrogen * * * is already known. * * * Recently Sabatier and Senderens of Paris have discovered that other finely divided metals will also exercise a cata-

lytic effect on hydrogen, viz. : iron, cobalt, copper and especially nickel."

"By causing acetylene, ethylene or benzene vapour in mixture with hydrogen gas to pass over one of the said metals (which had just been reduced in a current of hydrogen) the said investigators obtained from the unsaturated hydrocarbons, saturated hydrocarbons, partly with simultaneous condensation."

"I have found that by this catalytic method it is easy to convert unsaturated fatty acids into saturated acids."

"This may be effected by causing fatty acid vapours together with hydrogen to pass over the catalytic metal, which is preferably distributed over a suitable support such as pumice stone. It is sufficient, however, to expose the fat or the fatty acid in a liquid condition to the action of hydrogen and the catalytic substance."

"For instance, if fine nickel powder obtained by reduction in a hydrogen current, is added to chemically pure oleic acid, the latter heated over an oil bath and a strong current of hydrogen is caused to pass through it for a considerable time, the oleic acid may be completely converted into stearic acid."

"The quantity of the nickel thus added and the temperature are immaterial and will only affect the duration of the process. Apart from the formation of small quantities of nickel soap, which may be easily decomposed by dilute mineral acids, the reaction passes off without any secondary reaction. The same nickel may be used repeatedly. Instead of pure oleic acid, commercial fatty acids may be treated in the same manner. The fatty acid of tallow which

melts between 44 and 48° C. has an iodine number 35.1 and a yellow colour will after hydrogenation melt between 56.5 and 59°, while its iodine number is 98 and its colour slightly lighter than before, and it will be very hard."

"The same method is applicable not only to free fatty acids, but also to the glycerines occurring in nature, that is to say, the fats and oils. Olive oil will yield a hard tallow-like mass; linseed oil and fish oil will give similar results."

"By the new method all kinds of unsaturated fatty acids and their glycerides may be easily hydrogenized."

The Normann patent clearly discloses that oils may be completely hydrogenized, that the process is progressive and that it involves "*no secondary reaction*," in other words, that cotton seed oil which starts edible remain so. The experiments and articles of Paul and Roth, which were alluded to at the trial, show that hydrogenization of oils including cotton seed oil was understood in the prior art.

Such being the state of the art, Edwin Cuno Kayser wrote Procter & Gamble from England that he had a process of considerable value and would like to talk to them about it; thereafter he came to America about November, 1907, bringing samples of hydrogenized cottonseed oil. He showed these to Burchenal, the superintendent of Procter & Gamble. As a result of his visit, he made an arrangement under a preliminary contract of January, 1908, to experiment upon the hydrogenized cottonseed oil as a substitute for lard. The first project was apparently to use hydrogenated cotton-

seed oil as a compound to be added to a percentage of beef stearin and cottonseed oil. Burchenal says he had done no work in connection with hydrogenizing cottonseed oil before he saw Kayser. He testified that:

"Mr. Kayser went out to our factory and made sketches as to the apparatus that would be necessary to carry on this work and the apparatus was ordered at once; a little plant was installed for experimental purposes and I think it was ready to operate sometime in January or February, 1908" (Deposition of Burchenal, page 11).

The defendant succeeded in obtaining contemporaneous memoranda as to some of Kayser's experiments from the records of Procter & Gamble. The first experiment was as follows:

"Fat Hardening Process by E. C. Kayser.

"First experimental lot was completed Jany. 17th, 1908. Fat treated—Summer Yellow Cotton-Seed Oil. Used Nickel Sulphate and Kieselguhr as described. Experiment was conducted by Mr. Kayser alone. He claims to have used about 1% Nickel Metal and 2% Kieselguhr.

"M.P. of fat after 3 hrs. $55\frac{1}{2}^{\circ}$ C.

"M.P. of fat after $6\frac{1}{2}$ hrs. 60.3° C.

"Dr. Bender reports as follows:

"Melting point of fat 60.3° C.

"Hydrocarbons .33%.

"Iodine value of fat 7.14%.

The fat does not contain free fatty acids. This material is much superior to the samples from J. Crossfield & Sons which showed an

iodine value of 52.26 and a melting point of 39.3° C. (The laboratory sample melted at 49.9° C). Their samples contained 5.12% free fatty acids and 2% hydrocarbons.

"Mr. Kayser reports as follows: 'The melting point of fatty acid, prepared from first lot hardened cottonseed oil is 62° C. This is several points higher than I ever got before. Presumably the composition of your oil differs somewhat from that of the oil I handled formerly.' "

Another experiment by Kayser of the date of March 5, 1908, was also obtained from the Procter & Gamble records in which the following melting points appeared:

5 hrs. at ordinary pressure 42° C.

1½ hrs. at 60 lb. pressure 43° C.

Von Phul testified that Kayser told him in 1907 that he was getting up a patent for a food product and even Burchenal's own testimony shows that Kayser *supposed* that the product he was making was edible. If Kayser at first told him it was not edible he did so when they were negotiating and he wished to keep his process in the dark until he had arranged his terms. That Kayser's statement that it was not edible was not taken seriously by either party is shown by the following testimony:

"Q887. But you did not know as a matter of fact whether it would be edible or not? A. I did not. Mr. Kayser stated that it would not be but that was his method of talking."

Both of these men were proceeding soon after Kayser's arrival in this country to develop hydrogenated cottonseed oil as a food product. Even if

the thought first occurred to Burchenal I cannot see that he did anything to carry it out in practice. Kayser's patent No. 1,004,035, application for which was filed March 20, 1908, disclosed the process which was employed to make the product covered by the patent in suit, and the specification for this Kayser patent contains the statement that "The time of treatment will vary with the progress realized and with the degree of saturation aimed at." It is to be remembered that Burchenal distinctly disclaimed in his testimony that he had anything to do with the invention of the process covered by the Kayser patents and we thus have a situation where Kayser invented the process and developed the product to the point where it was applicable to use as a food product. He came to America with a sample which as appears from the written record taken from the files of the complainant had a melting point of only 39 and developed other samples with melting points of but 42° and 43° in his March 5, 1908 experiments.

Moreover, it is to be remembered that Crossfield had employed Kayser to experiment in hydrogenating oil, that the former had been in close communication with Normann who had patented only four years before the process I have mentioned, and that Crossfield had so strenuously objected to the use by Procter & Gamble of the processes of Kayser that they were obliged to purchase their rights to them. It is also noteworthy that Kayser refused to testify in this case and that the witnesses as to the work of Kayser in America are officers or employees of the complainant. Under such circumstances the meagerness of the evidence which has been adduced to show that Burchenal had anything to do with the development of the lard-like food product which is the

subject of the patent in suit, coupled with his admission that the entire *process* under which it was made was the work of Kayser, is most significant and makes it impossible to find that Burchenal invented anything. The defendant has been embarrassed in its defence by many difficulties and has been obliged to go into the enemy's camp to secure almost all its ammunition. In spite of this, it has established that Kayser at the very beginning had developed not only a process but a product little differing from Crisco. Kayser remained with Procter & Gamble until well into 1910, and did not leave America until about July of that year. While there is some general evidence of what Burchenal and others did, or directed, I can find no real proof that anyone but Kayser did anything of substantial moment. No step was taken by Burchenal that could possibly amount to invention.

Complainant urges that the experiments of Kayser and the patents of Normann and Kayser aimed at complete saturation and that neither realized the importance of a partially hydrogenized product. But the process under which their products were made involved in its progress partial hydrogenation, and Kayser's patent No. 1,004,035 distinctly stated that "The time of treatment will vary with the progress realized and with the degree of saturation aimed at." Kayser as far as I can see did everything that was done to develop Crisco, and if his work fell short of this, he achieved enough so that the final step was inevitable to one skilled in the art. Kayser's process was the complainant's process and his product involved a progressive reaction fitted for any purpose. The broad discovery as between him and Burchenal certainly belongs to him.

Furthermore under any fair interpretation of the patent there is no infringement. The file wrapper indicates that the examiner rejected the claims as originally filed saying:

"* * * If the problem of simulating lard from cotton-seed oil were presented to an oil chemist, an incomplete hydrogenization of the cotton-seed oil would at once suggest itself to him as a solution of the problem. All the claims are accordingly rejected on the * * * ground of lack of invention."

Thereafter new claims were rejected upon the Kayser patents for the reason *that his process could be arrested at any time to produce an incompletely hydrogenized product*. Then and for the first time Burchenal filed an amendment setting forth certain percentages of linolin olein and stearin which his product should contain. It seems quite evident therefore that Claims 1 and 2 of his patent would under such circumstances, if valid at all, be limited to substantially the chemical composition described in the amended specification. Indeed the specification closes with the statement that the inventor has produced a product which "is high in olein, low in linolin and lesser saturated fats and with only enough stearin to make the product congeal at ordinary temperatures."

Under such circumstances it is impossible to treat the melting point as practically the determining factor and if this is not done the defendants product Kream Krisp does not infringe. After the examiner had held that an incomplete hydrogenation would suggest itself to any chemist seeking to simulate lard and rejected the claims on Kayser, the patentee, as I have shown, amended by specifying a particular product and dwelling upon the advantages of a small percentage of linolin to

avoid rancidity. If, therefore, the inventor contributed anything to the art it was this special chemical composition which his patent discloses. Claims 1 and 2 should consequently be construed in the light of the proceedings of Burchenal before the Patent Office and not given a scope which would monopolize an art in which Normann, Kayser and others had been the real pioneers.

Kream Krisp has a chemical composition extremely remote from that described in the specification of Burchenal. The following are the relative percentages:

	Burchenal	Kream Krisp
% Saturated fats	20-25	28
% Olein	65-75	34.3
% Linolin	5-10	37.7

Thus it appears that Kream Krisp instead of being low in linolin is extremely high, and that instead of being high in olein as specified in the Burchenal patent, it has a percentage of olein which differs but little from that existing in refined cottonseed oil unhydrogenated. In fact Kream Krisp seems to present many of the objections referred to in Burchenal's specification and to lack the very things upon which the latter based his right to receive a patent. Indeed the composition is much closer to the lard compound Jewel made out of stearin and cottonseed oil than to Crisco.

The bill should be dismissed with costs because the patent is void for lack of invention and for the further reason that claims 1 and 2 if properly construed are not infringed by the defendant.

Dated, October 3, 1917.

A. N. H.,
D. J.

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